high levels, particularly of phenolic compounds obtained under water and salt stress conditions in this study present a promising potential of manipulating culture and/or growing conditions for the production of desired metabolites with medicinal benefits.

doi:10.1016/j.sajb.2013.02.067

Transcriptional profiling of nodule development in soybean

S.G. Van Wyk[a], K.J. Kunert[a], B.J. Vorster[b]
[a]*Department of Plant Sciences, University of Pretoria, Pretoria 0002, South Africa*
[b]*Department of Plant Production and Soil Science, University of Pretoria, Pretoria 0002, South Africa*

Soybean is one of the most important sources of vegetable protein used for both food and animal feed world-wide. The symbiotic interaction between soybean (*Glycine max cv.* Williams) and nitrogen fixing bacteria (*Bradyrhizobium japonicum*) provides fixed nitrogen for plant growth, seed production and ultimately crop yield. The bacteria are located in specialized structures, the nodules, on the roots of the soybean plants, which maintain a favourable environment for bacterial nitrogen fixation. However, the nodules have a short lifespan and they often senesce and die before the seeds have been filled. Moreover, the nodules are highly sensitive to environmental stress, particularly drought and temperature extremes, which trigger premature senescence and early death. However, little is known about the molecular processes that underpin stress-induced nodule senescence and mechanisms that enable plants such as soybean to tolerate drought and other stresses. The study has therefore been designed to address these issues directly and to gain new knowledge that will assist to produce soybean varieties with improved stress tolerance. The aim of the research is to enhance the understanding of the specific functions of the soybean cysteine protease - cysteine protease inhibitor system in natural and stress-induced premature nodule senescence. Progress to date includes the identification of all the cysteine proteases and cysteine protease inhibitors present in soybean, as well as characterization of their expression and change in expression from development and onset of natural senescence. Further characterization of the individual components of the protease-protease inhibitor system, might make it possible to silence a particular cysteine protease or recombinantly express a specific natural or engineered cystatin in soybean nodules that could possibly delay either natural or stress-induced nodule senescence.

doi:10.1016/j.sajb.2013.02.068

Ecological implications of smoke-derived compounds in grassland soils following fire: Germination activity of smoke residues in soil and quantification of two active compounds

M.E. Light[a], H.M. Ghebrehiwot[a], M.G. Kulkarni[a], G. Szalai[b], V. Soós[c], E. Balázs[c], J. Van Staden[a]
[a]*Research Centre for Plant Growth and Development, School of Life Sciences, University of KwaZulu-Natal Pietermaritzburg, Private Bag X01, Scottsville 3209, South Africa*
[b]*Department of Plant Physiology, Agricultural Institute, Centre for Agricultural Research, Hungarian Academy of Sciences(ARI-HAS) Brunszvik u, 2462 Martonvásár, Hungary*
[c]*Department of Genomics, Agricultural Institute of the Hungarian Academy of Sciences (ARI-HAS), Brunszvik u2, 2462 Martonvásár, Hungary*

Smoke from burning vegetation contains many highly active chemicals that may play a role in promoting seed germination and enhancing post-germination processes. The butenolide compound in smoke responsible for enhancing germination in many species has been identified as 3-methyl-2*H*-furo[2,3-*c*]pyran-2-one (karrikinolide, KAR_1). A structurally-related butenolide, 3,4,5-trimethylfuran-2(5*H*)-one (trimethylbutenolide, TMB), which inhibits germination and reduces the effect of KAR_1, was also identified recently. The mechanisms of action and interaction of these compounds is not yet fully understood. Furthermore, the ecological implications of these compounds remaining in the soil following a fire and the spatial influence of smoke drift on burnt sites and neighbouring areas has not been explored. This study assessed the germination activity of extracts from burnt soil samples and quantified the amount of KAR_1 and TMB present in the soil following a grassland fire. Extracts of the soil samples, taken at depths of 0–2, 2–4, 4–6 and 6–8 cm, were prepared using dichloromethane and tested for germination activity using achenes (seeds) of Grand Rapids lettuce (*Lactuca sativa* L.cv. 'Grand Rapids'), which are known to respond to smoke extracts and these chemicals. At all soil depths, the Grand Rapids lettuce seeds exhibited significantly higher germination when treated with burnt soil extracts compared to the no-burn soil (control). The Grand Rapids lettuce seeds also showed significantly higher germination when treated with soil extracts from the adjacent plots. Compared to the no-burn soil, a higher concentration of KAR_1 and TMB were detected in the top layers (0–2 and 2–4 cm) of the burnt soils. Findings of this study indicate that smoke increases the levels of KAR_1 and TMB in the soil which may influence germination of seeds of certain smoke-responsive plant species in the soil seed bank.

doi:10.1016/j.sajb.2013.02.069

The role of different explants on the transformation efficiency in *Dierama erectum* Hilliard

M.J. Koetle, P. Baskaran, J.F. Finnie, J. Van Staden
Research Centre for Plant Growth and Development, School of Life Sciences, University of KwaZulu-Natal Pietermaritzburg, Private Bag X01, Scottsville 3209, South Africa

Dierama erectum is a member of the Iridaceae and is regarded as an important horticultural plant due to its high ornamental value. The species has an erect inflorescence with about 10 flowers on each inflorescence. The high economic potential of *D. erectum* is attributed to its large size and production of erect flowers. Tissue culture methods for improvement of ornamental plants are vital for their regeneration and development. A quick and effective method is needed to facilitate selection of putative transformants during genetic manipulation of *D. erectum*. The aim of this study is to use different explant sources; hypocotyls, shoots, and embryogenic calli for developing a transformation procedure for early flower induction in *D. erectum*. An effective micropropagation protocol was thus developed and results showed that maximum shoot production (12 shoots per explant) can be achieved with hypocotyl explants cultured on Murashige and Skoog medium supplemented with 1.0 μM benzyladenine (BA) under a 16 h photoperiod at 100 $\mu mol\ m^{-2}\ s^{-1}$. One-month-old regenerated shoots were used to induce embrogenic calli with various concentrations and combinations of BA, 2,4-dichlorophenoxyacetic acid (2,4-D) and 4-amino-3,5,6-trichloropicolinic acid (picloram). Further experiments including the characterization of the resultant calli are on-going.

doi:10.1016/j.sajb.2013.02.070